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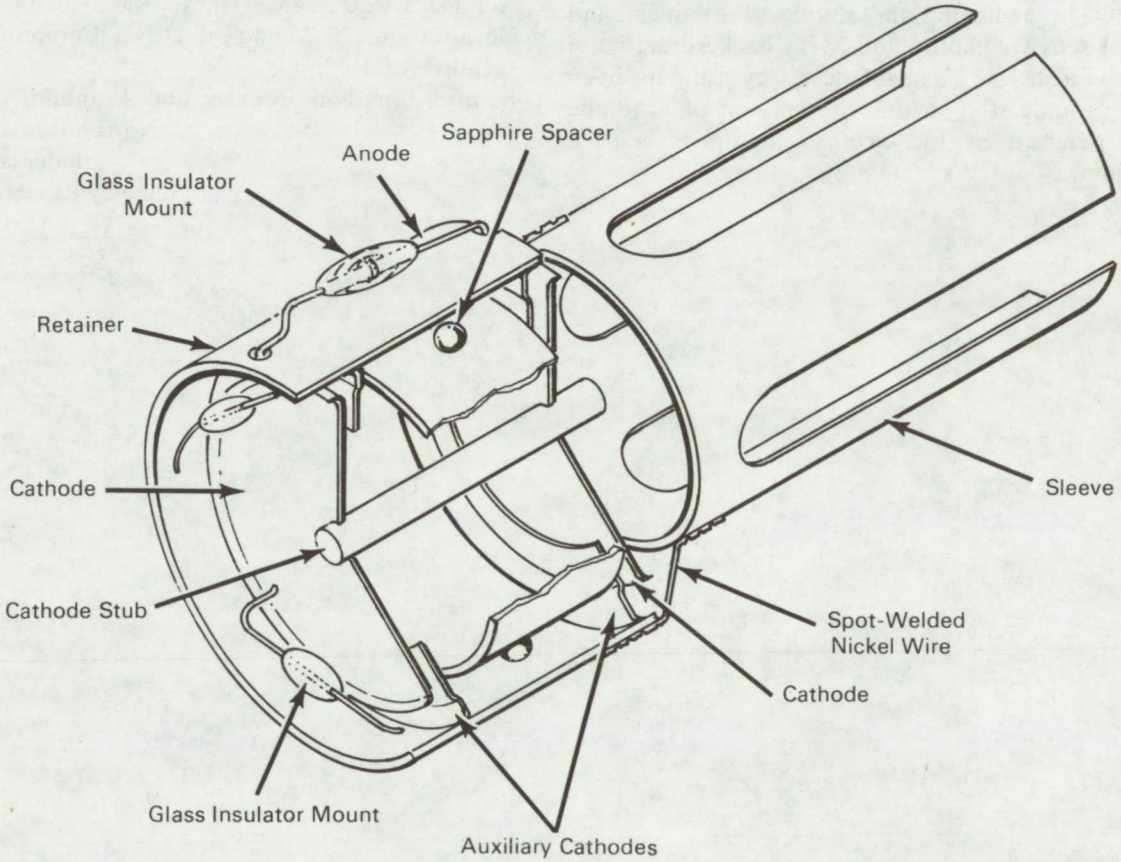
NASA TECH BRIEF

Improved Magnetron Cold-Cathode Ion Source



The problem:

The measurement of residual gases in an ultrahigh vacuum ($\lesssim 10^{-9}$ torr) has become a problem of increasing importance in vacuum instrumentation for basic research. While some improvements have been made recently in partial-pressure measuring instruments (mass spectrometers), two fundamental problems still have not been adequately solved to satisfy present and future requirements. First, these mass spectrometers employ inherently low-sensitivity ionization sources of the hot-filament type. Sensitivity improvements are only possible at the output of the analyzer. Second, these sources produce undesired spectra of gases which are difficult to differentiate

(continued overleaf)

from the spectra of the gases in the system under study. This undesirable characteristic further reduces the effective sensitivity of the measurement.

The solution:

A cold-cathode ionization source was developed which generates smaller amounts of spurious gases and has a higher sensitivity than commonly used hot-filament ion sources.

How it's done:

The ion source shown in the figure was designed to be fitted on a quadrupole analyzer. Based on the magnetron discharge, this ion source provides high sensitivity due to the long electron path inherent in the geometry of the source. Elimination of the hot filament normally used in the ion source reduces the amount of spurious gases generated within the spectrometer by removing the source of chemical and thermal activity. Photon and X-ray background noise are reduced below detectable levels by using an open ended cathode stub so that the amount of "cathode glow" detected by the electron multiplier is at a minimum.

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.65)

Reference: NASA-CR-66793 (N69-30820), Program to Produce a Flight Prototype Cold Cathode Quadrupole Mass Spectrometer

Patent status:

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act [42 U.S.C. 2457 (f)], to the Norton Research Corporation, 70 Memorial Drive, Cambridge, Massachusetts 02142.

Source: Jonathan Roehrig and Franklin Torney of
Norton Research Corp.
under contract to
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